

What is claimed:

- 1           1.       A method for manufacturing a semiconductor chip, the method comprising  
2 forming an electrode on a first surface of a semiconductor chip, and then digging a hole  
3 from a second surface of the semiconductor chip until the electrode is exposed.
- 1           2.       A method as in claim 1, wherein the second surface is located opposite to the  
2 first surface.
- 1           3.       A method as in claim 2, wherein the electrode is formed to include a first  
2 layer and a second layer, and the hole contacts the first layer of the electrode.
- 1           4.       A method for manufacturing a semiconductor chip, the method comprising:  
2 forming an electrode on a surface of a first semiconductor chip and thereafter forming a hole  
3 from another surface of the first semiconductor chip until the electrode is exposed, forming a  
4 protrusion by etching a surface of a second semiconductor chip and thereafter forming an  
5 abutting electrode on an apex section of the protrusion, and positioning the first  
6 semiconductor chip and the second semiconductor chip such that the abutting electrode  
7 contacts the electrode.
- 1           5.       A method as in claim 4, wherein forming a hole from another surface  
2 comprises forming the hold from a surface that is opposite to the surface the electrode was  
3 formed on.
- 1           6.       A method for manufacturing a semiconductor device, the method comprising:  
2 forming a metal film on a surface of a first semiconductor chip, forming a hole by an anodic  
3 forming method using a dielectric layer coated on an opposite surface of the first  
4 semiconductor chip as a mask, thereafter removing the metal film, and forming an electrode  
5 on a portion of the surface of the first semiconductor chip in a manner to embed the hole.

1           7.       A method for manufacturing a semiconductor device according to claim 2,  
2       wherein, after the hole is formed, a metal film is formed on the electrode from the opposite  
3       surface.

1           8.       A method for manufacturing a semiconductor device according to claim 3,  
2       wherein, after the hole is formed, a metal film is formed on the electrode from the opposite  
3       surface.

1           9.       A semiconductor chip comprising an electrode formed on a first surface  
2       thereof and a hole that exposes the electrode through a second surface thereof.

1           10.      A semiconductor chip according to claim 9, wherein the second surface is  
2       located opposite to the first surface.

1           11.      A semiconductor device comprising: a first semiconductor chip having a first  
2       electrode formed on a surface thereof and a hole through the first semiconductor chip that  
3       exposes the electrode, and a second semiconductor chip having a protrusion for insertion in  
4       the hole through the first semiconductor chip and an abutting electrode on the protrusion  
5       adapted to contact the first electrode.

1           12.      A semiconductor device according to claim 11, wherein the first  
2       semiconductor chip and the second semiconductor chip have a crystal orientation face of  
3       (100).

1           13.      A semiconductor device according to claim 11, wherein the first  
2       semiconductor chip and the second semiconductor chip have a crystal orientation face of  
3       (110).

1           14.    A semiconductor device according to claim 11, wherein a metal film is  
2 coherently formed on a surface of the first electrode, and the first electrode and the abutting  
3 electrode are brought in contact with each other through the metal film.

1           15.    A connection substrate comprising the semiconductor device set forth in  
2 claim 11.

1           16.    An electronic apparatus comprising a connection substrate set forth in claim  
2 15.

1           17.    A semiconductor device including  
2 a first substrate having a first electrode thereon;  
3 an opening extending through said first substrate, the opening positioned so that the  
4 first electrode extends across the opening;  
5 a second substrate including a protrusion on which a second electrode is located;  
6 wherein the protrusion extends into the opening and the second electrode is  
7 electrically connected to the first electrode.

1           18.    A semiconductor device as in claim 17, further comprising an conducting  
2 adhesive disposed between the first electrode and the second electrode.

1           19.    A semiconductor device as in claim 17, further comprising a metal layer  
2 between the first electrode and the second electrode.

1           20.    A semiconductor device as in claim 17, further comprising a dielectric layer  
2 on a surface of the first substrate that faces the second substrate to electrically separate  
3 portions of the first substrate from the second substrate.

1           21.    A semiconductor device as in claim 17, wherein the first electrode and  
2 second electrode are in direct contact with each other.

1           22.     A method for forming a semiconductor device comprising:  
2           forming a first electrode on a first surface of a first substrate;  
3           forming an opening from a second surface of the first substrate to the first surface,  
4     wherein a portion of the first electrode is exposed through the opening;  
5           forming a second electrode on a second substrate;  
6           positioning the second electrode in the opening and electrically connecting the first  
7     electrode to the second electrode.

1           23.     A method as in claim 22, further comprising forming a dielectric layer on at  
2     least one of the first substrate and second substrate and positioning the dielectric layer to  
3     prevent a short circuit between the first substrate and second substrate.